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ABSTRACT

Part of a series of experimental units for students at the preschool level, this unit is designed to develop number concepts through counting. A short discussion of the mathematical background, an outline of the unit, a discussion of the objectives, a list of materials needed, and sequences of learning activities for the children are included. The student's workbook is included in the appendix. For other documents in this series, see SE 016 124 through SE 016 129. (Author/DT)

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U.S. DEPARTMENT OF HEALTH
EDUCATION & WELFARE
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EDUCATION

MATHEMATICS EDUCATION

COUNTING

WILLIAM D. McKILLIP

PRESCHOOL
MATHEMATICS
PROJECT

College of Education, University of Georgia

SE 016 128

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Practical Paper No. 28

COUNTING

by

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September, 1969

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TABLE OF CONTENTS

	Page
Note To The Teacher.	iii
Materials List	iv
Mathematical Background	1
Unit Organization.	3
Unit Objectives.	4
Activity Sequence I.	7
Activity Sequence II	13
Activity Sequence III.	17
Activity Sequence IV	28
Activity Sequence V	31
Appendix I, The Train Book (Student Workbook). . . .	34

NOTE TO THE TEACHER

This is an experimental unit designed to develop number concepts through counting. In this booklet you will find a short disucssion of mathematical background, an outline of the unit, a discussion of the objectives of the unit, a list of materials you will need, and sequences of learning activities for the children. The time required for this unit will depend on the age and previous experiences of the children; we estimate that this unit will take from two to five weeks.

It is the intent of the author of this unit to make these activities so naturally pleasant for children that they will engage in them voluntarily. Please try to conduct these activities in a game-like or playful way. It is, after all, not essential for a child to do these things, although we do feel it is desirable.

One question deserves a rather extended explanation. Throughout this unit children will be encouraged to do a variety of tasks, some more difficult and total. How we respond to a child's failures and successes will have an impact on his ultimate attitude toward school, teachers, and learning. Of course, a correct answer deserves a rewarding response, one which indicates that you are pleased with the child and happy that he has succeeded. If a child does a task incorrectly, how shall we respond? Ask yourself "How was the child to get the answer to that question?" By recalling or repeating the learning activity try to get the child to see how he could have found the correct answer and why his answer was wrong.

This is an experimental unit. If it goes well, we are all happy. If it goes badly, it is because the unit needs improvement and not because of you. Please let us know if you find difficulty in using this material. We stand ready to help you change or supplement the material, or to withdraw it if it is not working.

William D. McKillip

MATERIALS LIST

Blindfolds---3 per class.

Cardboard Box---one, approximately 2' x 2' x 4" deep partitioned into four sections.

Cards, blank---20 per child, approximately 2" x 3".

Construction Paper---Include red, green, blue, and yellow.

Counting Objects---paper clips
checkers, 5 per child
paper cups, 5 per child
bottle caps
jacks
crayons
dominoes
blocks and toys

Counting Workbook---one per student.

Flannel Board.

Flannel Board Cutouts---include such objects as apples, children, animals, dogs, etc.

Picture or mural (large)---the scene should be familiar to the children, e.g., park, farm, city.

Shoe Box---one per six children.

String.

Transparencies---pp. 22-25 in the Counting manual and the traffic picture in the Counting workbook.

Fruit juice---Water may be substituted.

Magic Marker (dark color).

Hula-hoops or Circle of Rope.

MATHEMATICAL BACKGROUND

The primary objective of this unit is to begin the development of number concepts through counting; this may seem like a simple activity but there are some complexities which we should discuss before proceeding. It is useful to distinguish between rational counting and rote counting. The ability to count by rote, or memory, is the ability to say in sequence the number names one, two, three, etc. Nothing is implied by the phrase "rote counting" about the child's understanding of the connection between this chant and the number of objects in a set. By "rational counting" we mean the ability to find the number of objects in a set by counting; this implies an understanding of what it means to find the number of objects in a set and some understanding of number concepts.

In counting a set of objects the child must establish a one-to-one correspondence between the set of number names and the set of objects. As you have observed many times, this involves touching, looking at, or pointing to each object and simultaneously saying or thinking the number name. The diagram illustrates this process.

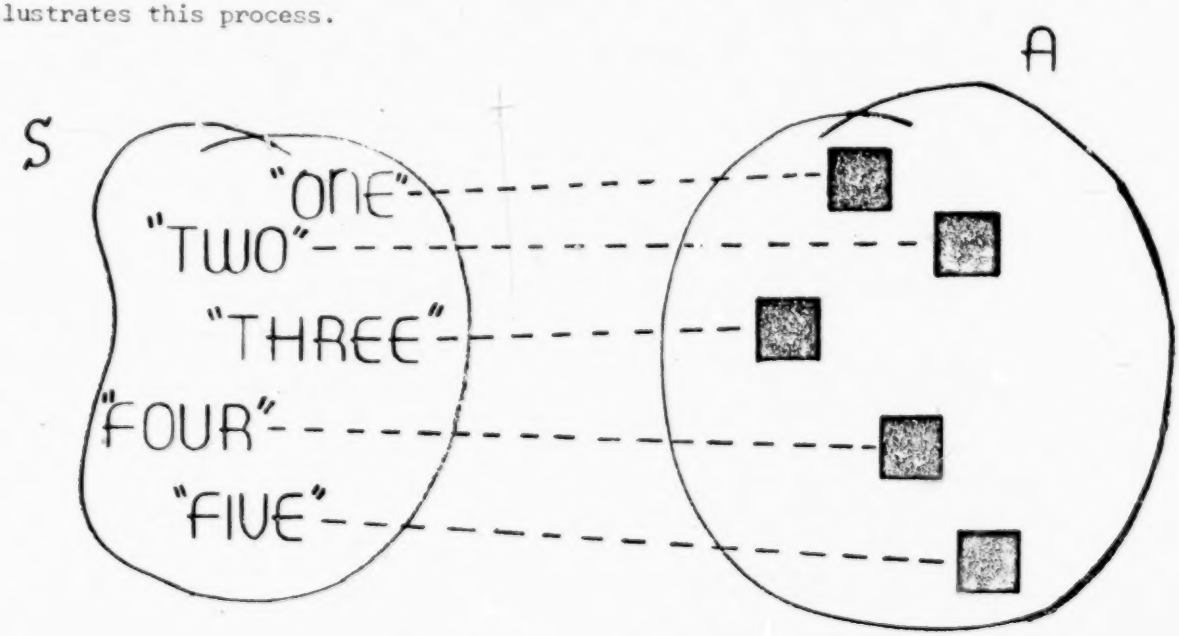


Figure 1

When the child has finished counting he has, if he understands the counting process, a bit of information which might be expressed "Set A contains 5 elements." The depth to which this understanding goes will vary from child to child but will, we hope, exceed the memorization of a single verbal response. Some of the ideas which are involved in understanding the counting process and developing the number concept follow.

1. If a set can be put in one-to-one correspondence with the number names "one, two, three, ..., n" then the set contains n objects.
2. If a set contains n objects then this set is in one-to-one correspondence with all other sets of n objects.
3. A set of n elements will have n elements regardless of physical rearrangement of the elements.

The number of elements in a set is in no way dependent on the order in which they are counted. The number of elements is the same using any order of counting. A number so determined is called a cardinal number and gives information about the set but not about any particular element of the set. Another way in which numbers are used is to put a collection in order so that we know a particular element which is designated "first," another which is "second," and so on. This use of number to determine or designate order gives rise to ordinal numbers.

We will, in the course of this unit, attempt to develop not only the ability to count but an understanding of natural number concepts which arise from counting situations. The numbers in the set, one, two, three, ..., are called the "natural numbers" or the "counting numbers."

The final phase of this unit is an intuitive introduction to the relation between counting and the operation of union of sets. This will, in a later stage of development, lead to the operation of addition.

UNIT ORGANIZATION

There are five distinct activity sequences in this unit.

1. Counting. The purpose of this sequence is to begin the child's introduction to rational counting.
2. Counting Practice. Further development of counting skill and understanding; counting a wide variety of things and counting larger sets.
3. Matching and Counting. The relationship between matching, one-to-one correspondence and counting is developed in this sequence.
4. Ordinal Number. The use of the ordinal numbers, first, second, third, and so on, and last, and the determination of ordinal position are developed.
5. Union and Partition. Counting sets of objects, unions of sets and set partitions.

The organization of this unit into "daily lessons" is not attempted. The activities are sequenced in a way which we consider natural and desirable (although this, too, will be altered if you report difficulties), but the quantity of work you and the children are able to do in a day depends on many factors we can't anticipate. Will you please tell us, by marking on this activity booklet, approximately the time spent on each activity?

Feel free to skip any activities which the children have mastered. In this activity booklet mark an activity "skipped" if you skip it, but first verify that the concepts and ideas involved are clear to the children. If you feel that your group could benefit at any point from more material than is provided, you may either invent it yourself but keeping, please, a record of what you do, or inform us and we will supply the material you need.

UNIT OBJECTIVES

In the statements which follow, "n" stands in place of some specific number. Where an objective is stated in terms of n, for example the statement "The child can count correctly a set of n elements," the specific number will vary from child to child and in a single child from time to time. The limit of correct performance, that is , the largest value of n, should be sought.

Mathematical Content Objectives:

1. The child counts with understanding to find the number of elements in a set (rational counting).
2. The child understands and uses cardinal and ordinal number concepts.
3. The child understands that two sets which match have the same number of elements and two sets which have the same number of elements will match.
4. The child understands that two sets may be combined and the union counted.

Word Usage Objectives:

1. The child uses, with understanding, the cardinal number words one, two, three, ..., n.
2. The child uses, with understanding, the ordinal number words first, second, third, ..., last.
3. The child uses, with understanding, the words "in both" and "altogether."

Behavioral Criteria:

1. The child uses the counting process, the numerical information obtained from counting, and number concepts in appropriate situations, examples of which follow.

a. The child counts correctly a set of n elements when asked "How many ..." or "Please count ...." The child will, often counting, reply "There are n things" or some equivalent expression.

b. The child understands and correctly carries out instructions involving number concepts; "Bring me six pencils, please."

c. The child uses number information when it is appropriate, without being asked to do so, in communications with others: "We need four cups at our table."

d. The child can tell the number of elements in an unseen set if he knows that it matches a set he can see. He can predict whether or not two sets will match if he knows the number of elements in each .

2. The child uses the counting process to determine order (first, second, third, and so on) and uses ordinal numbers in appropriate situations.

a. The child can identify the first, second, third, ..., object in an ordered set of objects and can also identify the last object. If asked "who is third in line?" The child can correctly identify the person by naming or pointing.

b. The child can determine the ordinal position of an element in a sequence. If asked, "where in the row is the blue block?" he can correctly determine the blue block's position.

3. The child recognizes that the number of objects in a set is a constant not dependent on the position of the objects. Having determined that a set contains n objects the child will maintain that the number is unchanged even though physical rearrangement of the elements has taken place.

4. The child will form the union of two sets and count the number of

elements in that union in appropriate situations.

a. If asked, "How many checkers are in both cups?" he can correctly combine and count the number of checkers.

b. If told that Sally needs three cups at her table and Jimmy needs 4 cups at his table, he can correctly determine how many cups are needed altogether, possibly counting to determine his answer.

MATERIALS

The following is a list of materials needed for the activities in this booklet.

Collection of large blocks or toys--" large counters"-- rubber balls, milk cartons, blocks, toys

"Counters": bottle caps, checkers, jacks, pennies, crayons, dowel rods, paper clips, dominoes, dice, poker chips

Paper cups

Hula hoops

String

At least 3 colors of construction paper

5 or 6 cardboard boxes approximately 2' x 2' and cardboard dividers

Blindfolds

Flannel board and large cutouts of objects such as animals, fruit, clowns, etc.

A large picture with several objects that are alike which children can recognize and count. A picture of a farm with the different animals would fit the requirement

Transparencies of pages 22 through 25.

5 or 6 shoe boxes with a slot cut in the top

ACTIVITY SEQUENCE I

Counting

Objectives:

In this sequence we begin the childs introduction to rational counting and number concepts. The child should learn number words and begin to use them in meaningful ways.

Activity 1:

Arrangements: The whole class will work together; all students arranged more or less in a circle.

Materials: A collection of large blocks or toys, hula-hoops

Have three boys stand in the center of the circle. Place the hula-hoop (or a circle of rope, etc.) on the floor. Say "How many boys are here? We can tell by counting them. Count the boys as they step into the hula-hoop. One, two, three. There are three boys in the hula-hoop." You do not need to use exactly the same words each time but the essence of what you are teaching is that if the count ends on three then we say there are three things.

When you (or the children) have counted the objects in the set you may now ask "How many children are in the hula-hoop?" The question may be directed to the group and a group response accepted or the question may be directed toward an individual child.

This activity may be continued for a considerable period of time. You should vary the activity in these ways:

1. Number of objects. Use all the numbers from one on at least to five; older or more experienced children may be able to go on to ten.
2. Kinds of Objects. Use girls, boys, blocks, toys, etc. Also use sets of objects which are so miscellaneous they can only be refered to as "things."

3. Person who Counts. You count sometimes, the aid or a visitor may count at times, the class should count in unison frequently, and individual students should count as soon as they can. It is important to shift the responsibility for counting from you to the students.

Activity 2:

In practice you may intermix activity one and activity two, working from smaller to larger numbers.

Arrangements: Students in groups of four to six with an aid or teacher at tables or on the floor.

Materials: A collection of counting objects; bottle caps, dominoes or checkers, one paper cup and a 20 inch string tied in a circle for each each student.

Drop checkers in each student's cup. You should use different numbers of checkers for different students. Ask the students to count to find out how many checkers they have in their cups. They may count by taking the checkers out one at a time or by looking into the cup and pointing at the checkers one at a time. For now, encourage the students to take the checkers out of the cup one at a time, counting each checker. This makes it easier for you to observe each student to be sure they are counting correctly. The question you asked, "How many checkers do you have in your cup?" should now be answered by each child individually.

Put a supply of checkers in the middle of the table and a circle of string in front of each student. Go around the table asking each child to put a number of checkers in his circle. Use different numbers for different students. Watch to be sure that each student counts correctly.

You may add interest to this game by encouraging the students to build the highest tower they can and count the number of checkers in the tower. The ability

to build may out run the ability to count.

Activity 3:

Arrangement: Students in groups of four to six with an aid or teacher at tables or on the floor.

Materials: 5 paper cups, 5 each of the following counting objects: checkers, jacks, paper clips, bottle caps and crayons. (Note: Any small counting object may replace any of these five listed.)

The purpose of this activity is to give the pupil practice in working with sets of objects with cardinal number 1 through 5 and to select the set of counting objects with cardinal number 3.

At each table (or group) of children, place the 5 paper cups in a line in front of a designated pupil. In each of the five cups, you will have already put 1, 2, 3, 4, or 5 counting objects. (e.g. 2 paper clips in one cup, 3 checkers in one cup, 3 bottle caps in one cup, 4 jacks in another cup, and 2 crayons in the remaining cup.) Instruct the pupil to turn each cup over, one at a time, and to find out which cups have 3 things in them.

Change the number of counting objects in the cups and repeat the activity with another child. You may use the same procedure for recognizing sets with any cardinal number less than ten, as well as cardinal number 3.

Activity 4:

Arrangements: Pupils in groups of 4 to 6.

Materials: Three pieces of string, five paper cups and small counters.

At each table place five cups with one, two or three <u>different</u> counting objects in them. Make 3 rings from the pieces of string and place the 3 rings in different spots on the table. Tell the child to put all the cups which

contain one object in this ring; all those which contain two objects in this ring; and those which contain three objects in this ring (designate rings by pointing).

Vary the above activity in the following ways:

1. Use different and larger numbers of objects.
2. Use more paper cups.
3. Tell the students to sort the cups by the number of objects in the cup without designating a place to put each cup.

Activity 5:

Arrangements: Pupils working individually at tables.

Materials: 3 pastel shades of construction paper and a dark magic marker.

Cut the paper into approximately 2 inch by 3 inch rectangles. Use the magic marker to place dots (similar to the marks on a die) on one side of the cards. Prepare enough cards with one, two, three, four, five or six dots so that each child will have a total of 10-20 cards.

Have the children sort the cards into 3 stacks according to color. After each child has successfully sorted the cards by color, tell the child to sort the cards by the number of dots on each card. It may be necessary to be more specific. i.e. place all those with 1 dot "here" all those with two dots "there," etc.

Activity 6:

Arrangements: Students working individually at tables

Materials: One copy of the student text "Counting" for each student.

The students should be told to find the proper page by counting squares. Help them count the squares to find the page on which to work.

Counting, Student Text

Page 1. A boy has some baloons. How many does he have?

Page 2. Black Dot. How many blocks are in the circle at the top of the page? How many turtles are in the circle at the bottom of the page?

Page 2. White Dot. How many trees are there in the picture?

Page 3. Black Dot. Draw three baloons.

Page 3. White Dot. Make four marks.

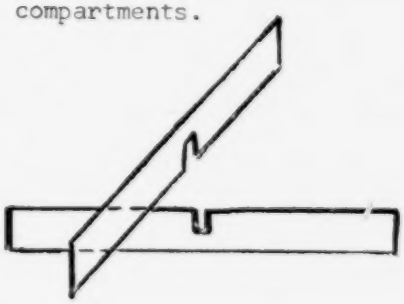
Page 4. You may want to talk about trians with the children before doing the page. This is an "old fashioned" train which few if any of the children will have seen. What kinds of trains have they seen? Who has ridden on a train?

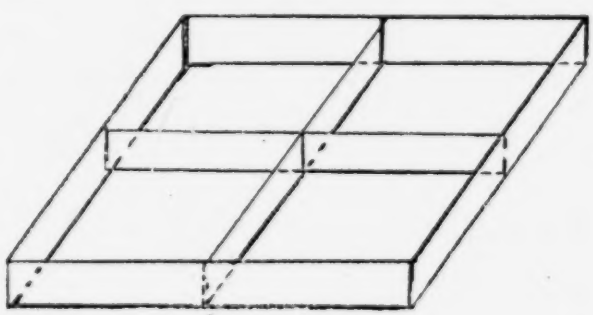
First use this page for counting practice. Count smoke puffs, hand rails, windows, etc. Then ask the children "What is missing from this train?" (Wheels) If the children don't see it, tell them. Say "Draw four wheels on this train."
The train is the property of the Georgia Rail Dispatch Company.

Activity 7:

Arrangements: Pupils in groups of four to six with an aid or teacher at tables or on the floor

Materials: For each table a flat box with dividers partitioning it into four compartments.





The dividers can be made by cutting two strips of stiff paper in appropriate lengths, cutting each of them halfway through at the middle and fitting them together. A cardboard box which is approximately square can be cut down to a height of four inches to make the flat box. Ten fairly large counting objects are also necessary for each table.

At each table place two or three counting objects in each section of the box. Ask the students to count the number of objects in the box. After the children are counting successfully change the arrangement of the objects by moving an object from one cell into another. Again ask the students to count the number of objects in the box. Vary the activity by moving one or more objects from the same cell or by moving objects from different cells or by interchanging objects. When you are sure that the children recognize that changing the arrangement of objects in the box does not change the number of objects in the box you may wish to move all objects from one section and ask: "How many objects are there in this section?" (Point.) Expect "not any" or "none."

ACTIVITY SEQUENCE II

Counting Practice

Objectives:

After counting has been introduced and the children have started using the number words a great deal of practice is needed with various objects and in various situations in order to develop number ideas as abstractions free from any one specific physical situation. This activity sequence provides this practice. You may feel free, in this sequence, to invent, improvise, or develop new and different activities. Please make a note in this book of the things you invent yourself.

The activities in this sequence are to a certain degree uniform; they all follow one of two different styles. One way to proceed is to ask a child to count a set of objects and draw a conclusion which he states verbally. "There are five children here" or an equivalent statement. The second sort of procedure is to request that the child do a task which requires him to count. His performance is the counting but he should be encouraged to talk about this performance as extensively as he can.

Activity 1:

Arrangements: Students working in groups of 4 to 6 at tables.

Materials: Blindfolds, blocks, dominoes, checkers, etc. that child can manipulate easily.

Play the "Blindfold Game" by giving each table two or three blindfolds and a supply of objects such as checkers or dominoes to be counted. Have two or three at each table blindfolded; the other children put piles of objects (less than or equal to 5) in front of the blindfolded children. The children should generally start putting one or two objects in front of each blindfolded child and then working up to five. If a child has trouble in counting blindfolded,

the child may remove the blindfold and count the objects. Continue until all children at each table have had an opportunity to count several times. If children are successful, then procedure could be varied by having the children count groups of unlike objects such as a checker, a block, a shoe and a toy truck.

Activity 2:

Arrangements: Either working in groups or with the class as a whole.

Materials: None needed.

The teacher selects a child and asks him to make the sound a cow makes. The class counts silently the number of sounds the child makes, for example, "Moo Moo Moo" would be three. The child may repeat with a different number of sounds. The teacher then asks various children "How many 'Moos' did he make?"

Activity 3:

Arrangements: Children work as a whole class.

Materials: Flannel board, large cut-outs of objects such as apples, children or animals.

This is another step in providing child with experiences in counting objects that he does not manipulate. Previously the children have had experience in counting sounds and in counting objects they could not see. This lesson can be repeated with variations if you think children need the practice in counting five objects correctly, and if they enjoy doing this activity. In fact, this would hold true for all lessons.

Teacher puts cut-outs of different numbers of like objects on the flannel board and asks different children how many objects are on the board. When children can answer correctly, then you may put cut-outs of varying numbers of different kinds of objects, say 1 apple and 3 dogs, and ask different children

children how many objects or things are on the board.

You may now ask individual children to come to the flannel board and put up different numbers of objects or you may put pictures of varying numbers of objects on the board and ask different children to bring to you the same number of checkers.

Activity 4:

Arrangements: The whole class will work together; all students arranged in two roughly semicircular areas facing the flannel board.

Materials: Flannel board and cutouts that can be put up to use as counting objects.

Proceed as in Activity 3 with these changes:

1. After the cutouts have been put up and different children have told you how many objects there are, change the arrangement of the objects and repeat the question.
2. Place all of the objects in a row on the board and ask "How many objects are on the board?" Then change the order by moving one object to a new place in the row, (for example from second to last) and repeat the question. Vary the two activities by moving more than one object and by interchanging two objects or spreading the objects out.

In both of these activities the children should be the ones who put up and rearrange or reorder the objects.

Activity 5:

Arrangement: Pupils at their seats (class as a whole)

Materials: Large picture or mural of a park, farm, or any scene containing objects with which pupils are familiar.

The picture (or mural) should be placed at the front of the room so that each child can see it easily. Ask questions about the picture such as: "How many swings are there in the picture?" if it happens to be a picture of a park or playground; "How many pigs are there in the picture?" if it is a picture of a farm; "How many trees are there in the picture?" is a question which could be asked about either picture.

You may wish to have the class respond as a whole or to call on a particular pupil for each question. No matter which method of response you choose, after each question, have a volunteer (or someone you select) to come up to the picture and point to and count the swings, pigs, trees, etc. Doing this will verify the answers pupils have given.

ACTIVITY SEQUENCE III

Matching and Counting

Objective:

In this sequence we want to show the relationship between counting and matching. In particular, if two sets have the same number of elements they match and if they match they have the same number of elements. In the unit Matching we developed the idea "the same number" by matching, without referring to any specific number. Now we add to this the idea that if we count each of two sets which match we will count to the same number word.

Activity 1:

Go back to the unit Matching for review of the following ideas and word usages:

1. If two sets can be paired off element by element then they match.
2. If two sets match we use the phrases "one for each," "as many as," and "the same number as" to describe the relation between the elements in the sets. These ideas can be understood without reference to any specific number.

Verify that the students are able to compare two sets by pairing elements and are able to use the phrases listed above correctly. Review as necessary the activities in Matching, pages 16 to 23, which relate to these objectives.

Activity 2:

Arrangements: Children at desks or tables

Materials: A supply of counters should be available within reach of each child.

Match My Set: You, your aide, or a visitor will form a set in the front of the room. You may use the chalkboard, flannel board, a set of large toys or blocks, or any other convenient materials. The children are then told to take enough counters to match your set. Adults circulate and check each child's response. Repeat this several times using small numbers of objects in the sets you make up.

Now turn your flannel board around so that no child can see it. Make a "big show" of doing this. Arrange some objects on the flannel board and ask the children to get a set of counters which will match your set. Some children will guess and, inevitably, some will guess correctly. The idea, however, is to convince the children that they don't know how many counters to take to make a matching set.

Tell the children "My set has 4 (or 3 or 5 or whatever number it has) things in it. Now you can make a set which matches mine

Activity 3:

Arrangement: Pupils at table or on the floor in small groups of 4 to 6 children.

Materials: Shoe box with a slot cut in the lid and a set of red and black checkers.

Place the shoe box with its lid on in the middle of the group of pupils. Put a red checker on the table beside the box and say, "One checker for the table," and then put a black checker in the slot in the lid of the box and say, "and one checker for the box." Repeat this until you have the desired number of checkers on the table and in the box (about 4 or 5). Then ask the following question: "How many checkers are in the box?" Some child at the table may respond by counting the red checkers on the table and giving that number as the

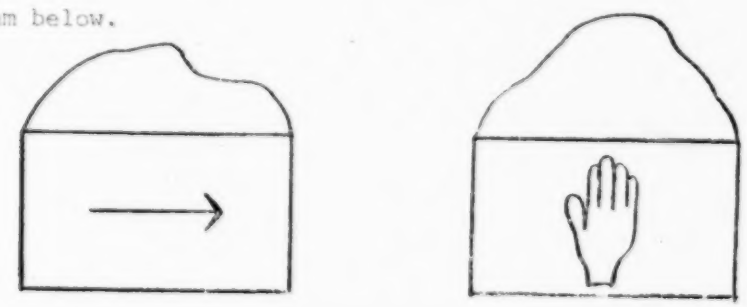
number in the box also. However, do not be surprised if a child points at the red checkers and says, "This many!" If this happens, simply ask, "How many is that?" If no child responds, then you will have to assist them by asking questions such as: "How many checkers are on the table?"; "Did I put a checker in the box everytime I put one on the table?" If there is still no response, remove the lid from the box and take the checkers from the box one at a time, matching each with a red checker on the table. When the pupils see that there are the same number of checkers in the box as on the table, replace the lid and repeat the procedure being sure to use a different number of checkers.

You should continue this activity until you feel that each child in the group has the concept of one-to-one correspondence between the red checkers on the table and the black checkers in the box. After you have done this twice, you should let a child place the checkers on the table and in the box. Be sure he says, "One checker for the table, and one checker for the box," as he does this. You might wish to tell him when to stop and to ask how many checkers there are in the box.

Activity 4:

Arrangements: Pupils working at tables in groups of 4 to 6.

Materials: A shoe box with a slot cut in the top for each table and a supply of counters for each student. 2 rectangular cards, for each table, a green one with an arrow on it and a red one with a hand on it as in the diagram below.



Begin this activity by talking about crossing the street and what green lights and red lights signify. Using a piece of string, hang the red and green cards about the necks of 2 children at each table. Explain to the children that whoever has the green card will begin the activity and that the one with the red card will end the activity. Open the shoe box and show that it is empty and then place it in front of the child with the green card. Ask him to put any one of his counters into the box and then tell the class the number of counters in the box. Let the child move the box, in the direction of the arrow, to the next child at the table. Have him deposit one of his counters in the box and tell the class how many are now in the box. He should say "two," if he says "one" it may be necessary to repeat the sequence or open the box and actually count the objects inside. Continue on around the table having each child deposit one counter and say aloud the number of counters that the box then contains. When the person with the red card has announced his count, open the box and verify the number by counting the objects as you or a child removes them. Repeat the activity and change "starters" and "stopers" after every round.

You may vary the activity in two ways. First, have the children deposit the counters as above but don't have them count aloud. When the child with the red card has deposited his counter ask someone to tell the others, the number of counters in the box. Verify the number by counting. Second do not use counters but simply move the box from the child with the green card to the child with the red card and ask, "How many counters would there be in the box if we started with John (green card) and ended with Mary?" (red card). Verify the answer by using counters and repeating the activity.

Activity 5:

Arrangements: Children working individually at desks or tables.

Materials: Each student should have a supply of counters and a piece of paper and pencil or crayon. You should have made transparancies of the next four pages of this book. A heat process copies will make transparancies from these pages.

Transparancy a: "Four boys are flying kites. Each boy has a kite. We can't see the kites - they are too high, they are out of the picture. You draw a kite for each boy." If the children cannot draw kites or if the drawing takes so much time that the point is lost you may either use counters or cut out kite shapes for the children to use. Be sure to supply each child with more kite shapes than he will need. "How many boys are in this picture?" "How many kites did you put on your paper?" The point of this is that since each boy has one kite and there are four boys there must be four kites.

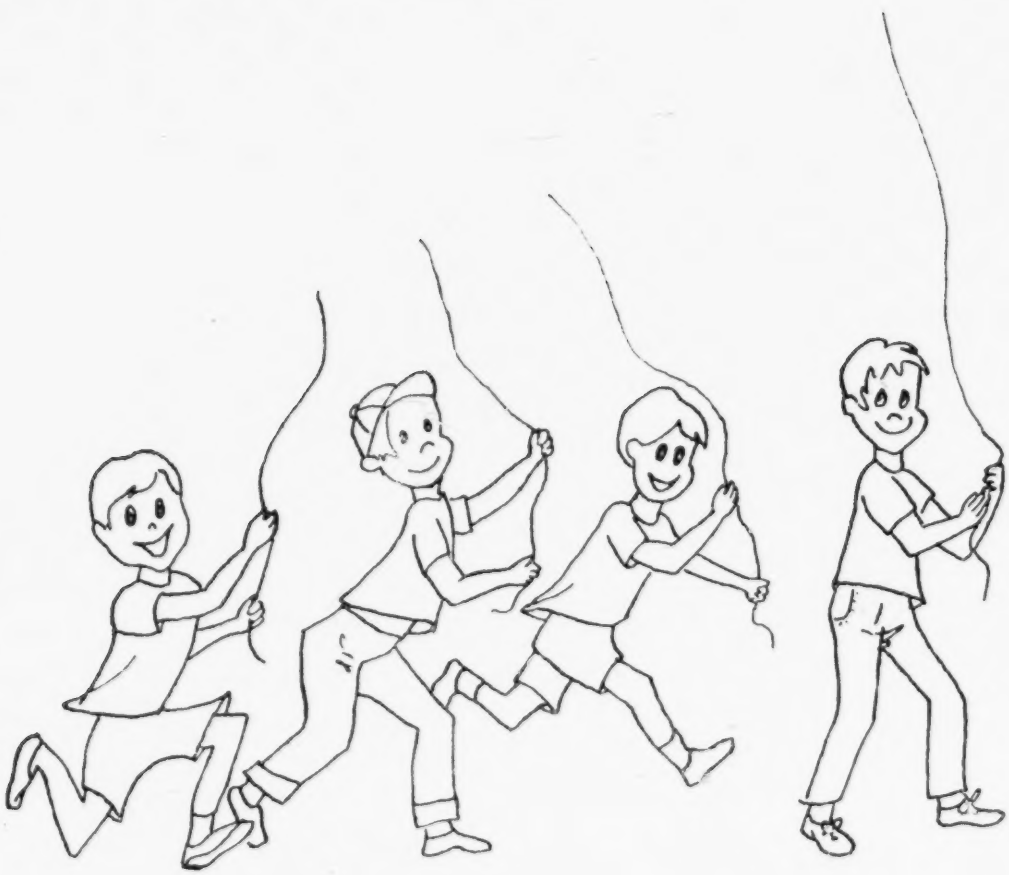
Transparancies b, c, and d: In each case the development would be the same. The child tells how many elements are in a set which he does not see. He can do this because the set he does not see matches one he does see. The sets which are not seen are (b) dogs which are sleeping in their dog houses, (c) passengers inside the train (each one has a grip on top of the train), and (d) kittens, one in the lap of each little girl.

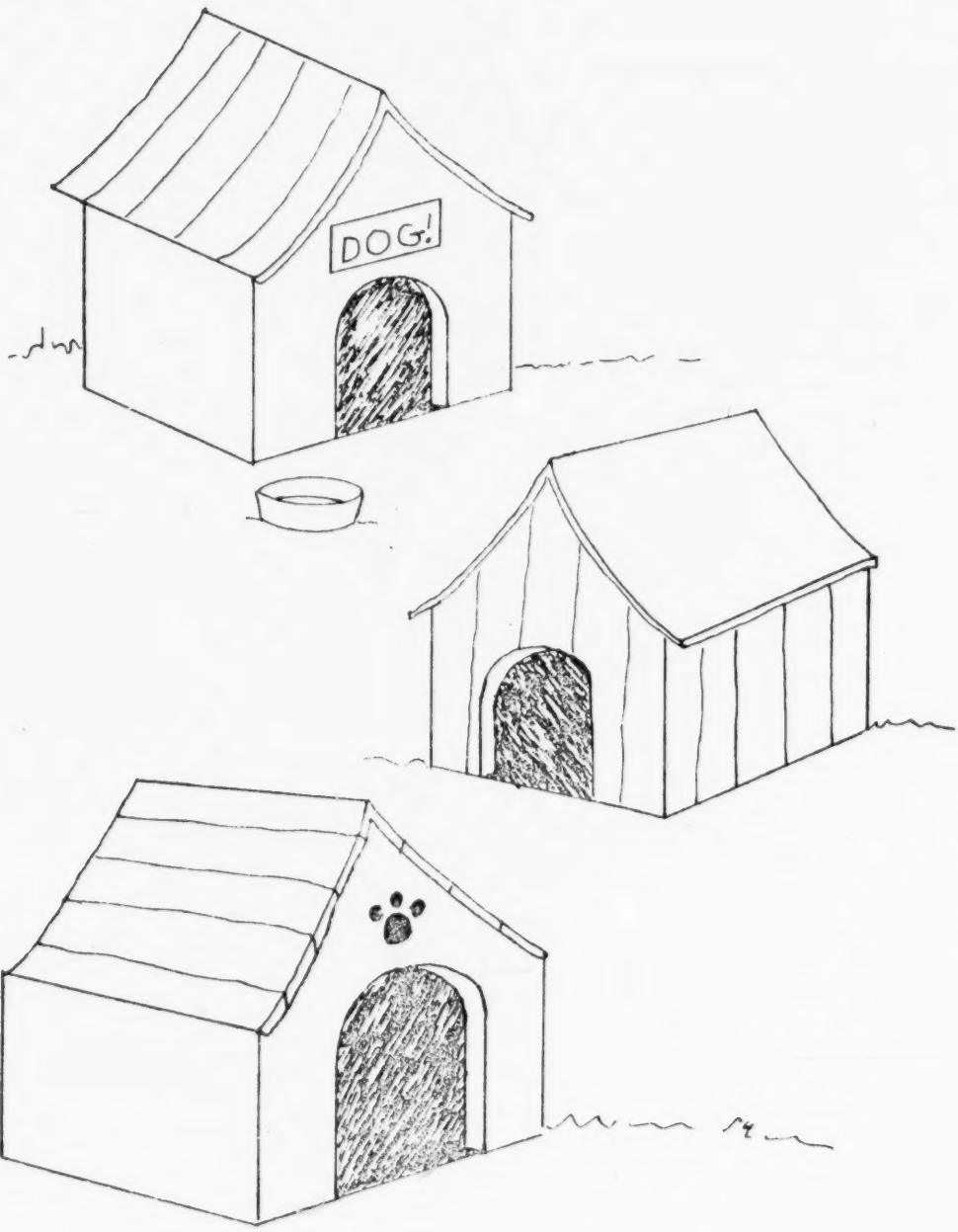
As you use these transparancies you and your aide should circulate around the room to be sure that all children are responding correctly.

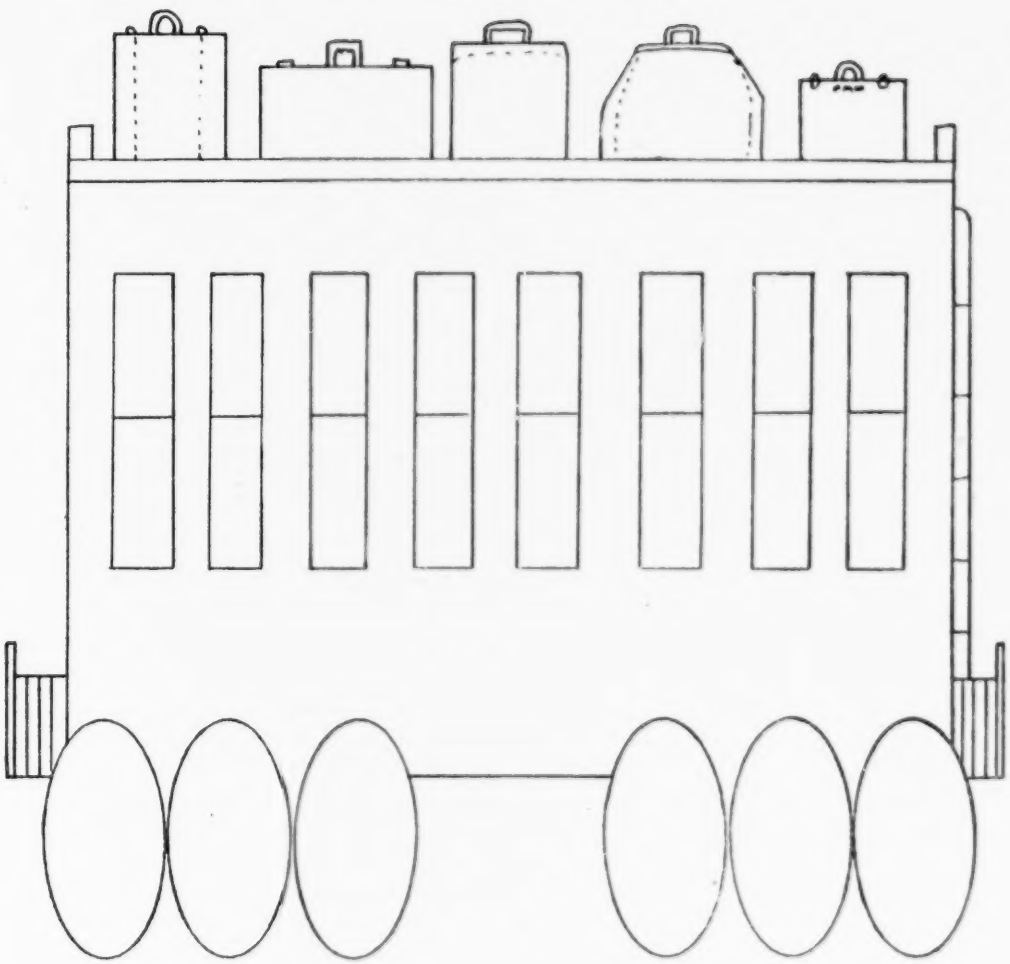
Activity 6:

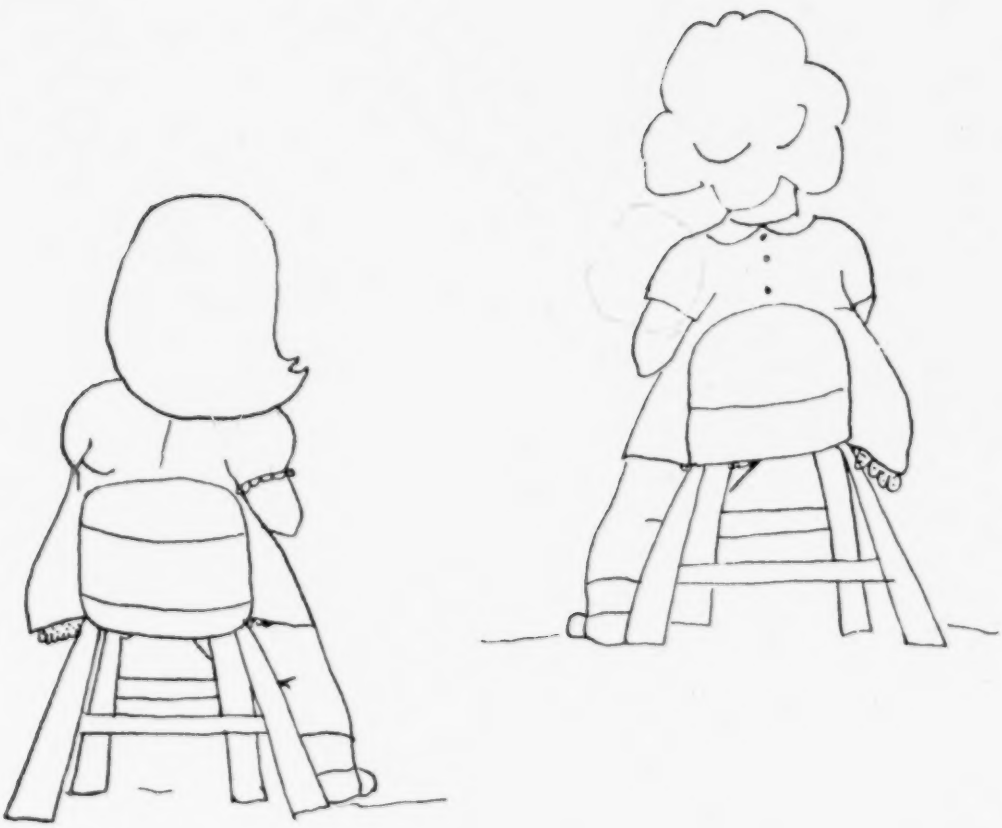
Arrangements: Children working individually at desks or tables.

Materials: Each child should have his copy of the student text "counting."




DOG!





Page 5. On this page there are six sets which we will compare in several ways. During this activity it is necessary for an adult to get an opportunity to talk to each child individually. The conversation might go this way:

(A) T: "How many frogs are there?"

C: "Two."

T: "Does the set of frogs match the set of ducks?"

C: "Yes."

T: "Show me that it does."

C: Here the child may draw lines, point, or otherwise pair the elements to show that the sets match.

T: "How many ducks are there?"

C: "Two."

A slightly different and more difficult task for the child who was able to do the things we asked him to do in the conversation just concluded:

(B) T: "Does the set of frogs match the set of ducks?"

C: "Yes."

T: "How many frogs are there?" As the teacher says this she covers the ducks with a piece of paper or with her hand.

C: "Two."

T: "Can you tell me how many ducks there are without looking?"

Correct Response: C: "Two."

T: "Count them to be sure." Remove the paper. "Were you correct?"

C: "Yes."

Conversation ends here.

Incorrect Response: C: "No." or "I don't know." or just a blank look.

T: Go back to (B) and go through the steps a second time. If the child still does not respond correctly, remove the paper and let him count the ducks. Conclude by saying: "If the ducks match the frogs there are the same number of ducks as frogs."

In working with two sets which do not match the conversation might go like this:

(C) T: "How many wiggly things are there? How many circles?"

C: "There are five circles and three wiggly things."

T: "Do these two sets match?"

C: "No." If the child is not sure ask him to try to match the sets. He should then conclude that they do not match.

Allow the child to count the number of elements in each set; you may cover the two sets just before you ask if the sets match. This forces the child to use available information to predict whether the sets will match.

ACTIVITY SEQUENCE IV

Ordinal Numbers

Objectives:

In this sequence we wish to introduce the children to the idea of position or order in a line and to the words we use to designate position or order. Numbers used in this way are commonly referred to as ordinal numbers: First, second, third, and so on, and last. The children should be able to identify the first, second, etc., person or thing in a line or row and should be able to name the position a person or thing holds.

During this activity sequence you will find many opportunities to use ordinal position. When ever a group of children line up for any reason you can ask "who is first?" "Who is second?" and so on. A child who is going to step into an existing line may be told "John, please get in line so that you will be third in the line." If you will use these opportunities both during and after this sequence it will contribute a great deal to the speed and permanence of the learning of these ideas.

Activity 1:

This activity is to be used whenever possible during the day.

Arrangements: The children are getting in line to go somewhere or do something.

Materials: None.

You will form the line one student at a time naming each ordinal position as it is filled. "John, will you be first? John is first in the line. Sally, will you be second? Sally is second in the line." Continue until the line has 5 or 6 children in it. Use ordinal number words past those the children use

but only two or three past. After that you may use the word "next" and for the last child in line the word "last."

When the line has been formed ask the first child to raise his hand, then the second, third, and so on as far as the children can go. Then ask children not in the line to name (or point to) the children in various positions: "Sam, who is first in the line?" etc. when a number of children have had an opportunity to respond the lesson will end and the line may move.

Activity 2:

Arrangements: The children working together as a class.

Materials: Each child should have a copy of the next page (traffic picture) and you should have a transparency for the overhead projector.

Talk about the line of traffic. Can the children talk about cars and trucks, big and little, cars which are like their family car, and other properties of the vehicles?

"Which car is third in the line? Count from the front of the line "first, second, third." Color the third car with a crayon. Count to determine the positions of the other cars and trucks in the line.

Activity 3:

The effect of changing places in a line on ordinal position in the line. Use this activity frequently.

Arrangements: The children are getting in line to go somewhere or do something.

Materials: None

A few children get in line and, as before, they identify themselves by ordinal position "Who is first? Will the first person raise their hand?"

"John, can you show me who is third in the line?" Now have two children change places; say the first and second children switch. Ask "Is John still first? Who is first now? What is John's position in line?" This activity may be repeated, with variations, frequently. Sometimes change second and third or first and fourth, etc.

Activity 4:

This activity should be used whenever possible during the day. The activity is similar to activity 1 but the idea the children are to learn is that inserting something in a line changes the ordinal positions of the objects behind it.

Arrangements: The children are getting in line to go somewhere or do something.

Materials: None

Form a loose line (large spaces between children) without naming the ordinal positions. Ask the first, second, etc., child to raise his hand. Question the children not in line about who is first, second, etc. Now ask a child to get in line so that he is second in the line. "John, please get in line so you will be second." Repeat the questioning about who is first, second, third, etc.

ACTIVITY SEQUENCE V

Union and Partition

Objectives:

In this sequence we introduce the idea of combining two or more sets and counting the number of objects in the union. The child should learn what is meant by the words "in both" and "altogether" and should begin to use the words meaningfully.

Activity 1:

Arrangements: Students working in groups of four to six, with an aid or teacher, at table or on the floor.

Material: A shoe box, 2 paper cups, and a supply of counters which are all the same for each table.

Place two cups and the shoe box on the table. Tell one child to put three objects, from the supply, in one cup and another child to put two objects, from the supply, in the other cup. Ask: "How many things are in both cups?" You may or may not get a response. If there is no response encourage guessing. Accept all guesses and don't give away the answer! Then say, "Let's see if anyone is right?" Have a child empty both cups into the shoe box. Then say, "Johnny, count the things in the box." Repeat the activity changing the number of items in each cup.

Activity 2.

Arrangements: Pupils working at tables in groups of 4 to 6.

Materials: Flat boxes like those used in Sequence I, Activity 7. Red, blue, green and yellow construction paper to line the 4 sections of each box. Large counting objects which are all the same for each table.

Tell the class that we are going to pretend that this box is a house with four rooms; a "red room," a "blue room," a "green room" and a "yellow room." At each table tell a child to place one object in the "red room," two objects in the "blue room," one object in the "yellow room" and two objects in the "green room." Make sure that the child places the correct number of objects in each section. Ask: "How many objects are there altogether in the house?" As in activity 1, put all the objects together on the table and count them to verify any answers or guesses. Repeat the activity with different numbers of objects. After this activity has been repeated a number of times ask the following question, "How many things are in both the red room and the blue room?" Use the same procedure as above to verify any answers or guesses. You may wish to use other combinations and numbers.

Activity 3:

Arrangements: Pupils in groups of three, four and five at tables or on the floor. Arrange the children so that not all the groups have the same number of children in them and no group has more than 5.

Materials: Fruit juice and paper cups

This activity can be used during the mid-morning recess. If you do not serve juice or milk use water.

Choose a particular child and ask: "How many cups do you need for those in your group?" Make sure the child counts correctly and includes himself. Ask someone in another group the same question. Then say to someone in one of the 2 groups, "How many cups are needed altogether? I want you to get the cups for both of these groups." If the child gives no answer it may be necessary to join the 2 groups and have him count the children in the new group. If the child

gives an answer, correct or incorrect, have him get that number of cups and distribute them. If he gets too many cups or too few cups it will, again, be necessary to join the 2 groups and count the number in the new group. Repeat the activity until all the children have cups.

This activity with minor revisions can be used any time it is necessary to distribute material to the class. Take advantage of these situations to let children form unions of sets and count the numbers of elements in the union.

APPENDIX I

THE TRAIN BOOK

MY NAME IS

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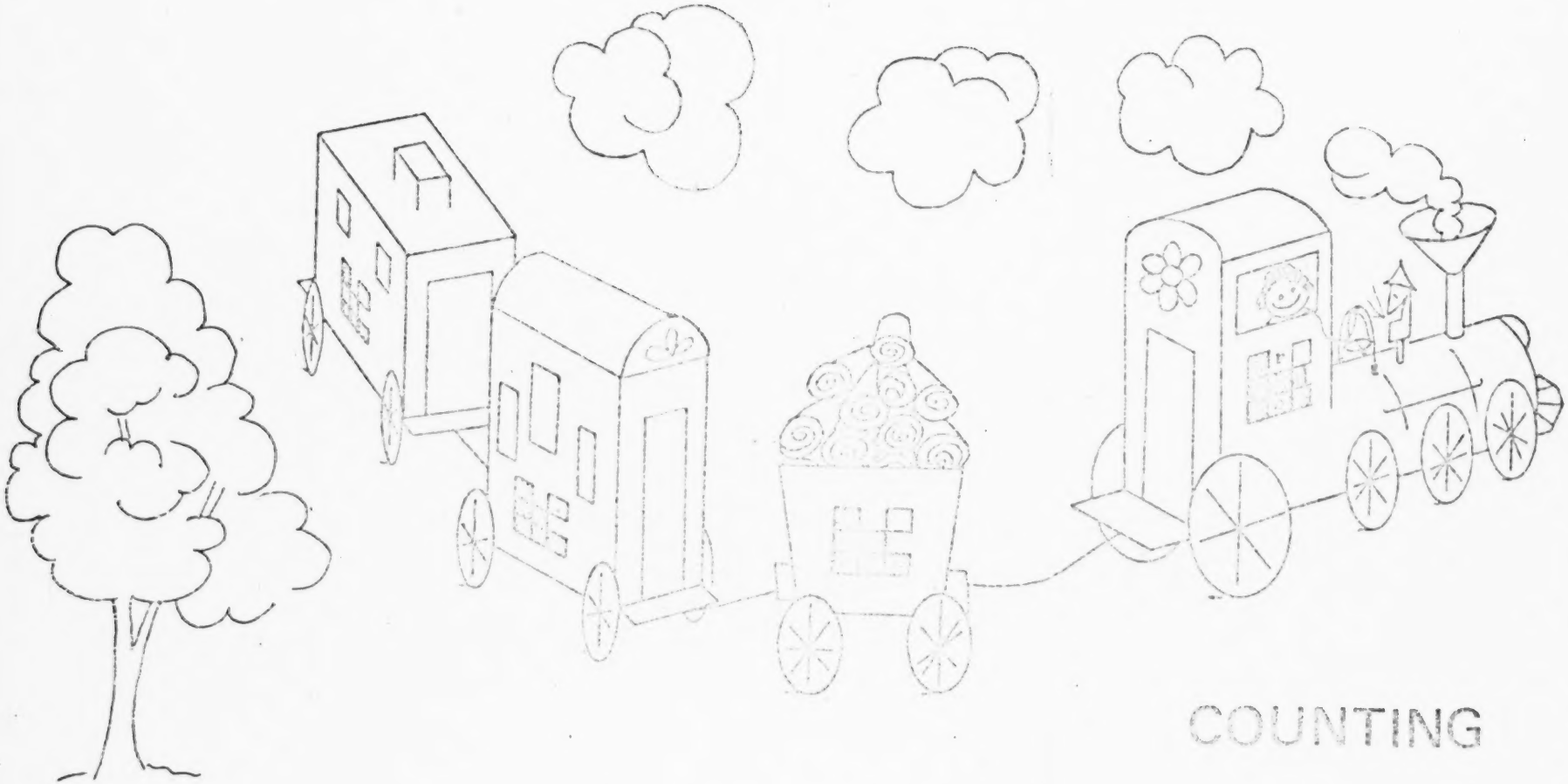

COUNTING

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